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CENTRAL INTELLIGENCE AGENCY
INFORMATION FROM
FOREIGN DOCUMENTS OR RADIO BROADCASTS

REPORT
CD NO.

50X1-HUM

COUNTRY	USSR	DATE OF INFORMATION	1947
SUBJECT	Scientific - Electrical industry		
HOW PUBLISHED	Monthly periodical	DATE DIST.	19 Apr 1949
WHERE PUBLISHED	Moscow	NO. OF PAGES	5
DATE PUBLISHED	November 1947		
LANGUAGE	Russian	SUPPLEMENT TO REPORT NO.	

THIS IS UNEVALUATED INFORMATION

SOURCE Elektrichestvo, No 11, 1947. (Information requested.)

30 YEARS OF DEVELOPMENT OF ELECTROTECHNOLOGY IN THE USSR

/Summary/

Among general developments of electrotechnology for 30 years under Soviet rule, one achievement was the establishment and implementation of the GOELRO (Plan for the Electrification of the USSR). Present-day technologists mentioned are Popov, Papaleski, Mandel-shtam, Stoletov, and others.

Theory of Electricity

General information on some of the more important Soviet scientists who have contributed to knowledge relative to the theory of electricity includes those noted: Ya. I. Frenkel, electrodynamics, G. A. Grinberg, mathematics of electrostatic and electromagnetic fields; I. M. Frank and V. L. Ginzburg, theory of the optic effect which was derived from the classic electromagnetic theory of light; and others.

Magnetodynamics

V. K. Arkad'yev gives a brief historical summary of the achievements of Soviet scientists and technicians in this field. The editor was active in Magnetodynamics in 1911, when he was able to determine the frequency of a magnetic field at which ferromagnets lose their magnetic properties. During World War I he studies the magnetic properties of aperiodic fields.

In 1939 M. A. Divil'kovskiy determined methods for computing the magnetization of a sphere in a sinusoidal field. Future tasks revolve around the solution of the nature and oscillating mechanisms of molecular magnets. Among the contributors in this latter field are Ya. I. Frenkel', Ye. M. Livishitz, L. D. Landau, and N. S. Akulov.

Theoretical Fundamentals of Electrical Engineering

Information obtained from material presented by L. I. Gutenmakher, P. L. Kalantarov, E. A. Meyerovich, L. R. Neyman and Ya. M. Chervonenkis is summarized.

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Historical review shows the progress made by V. F. Mitkevich, V. I. Kovalenko, and others in determining methods for studying electromagnetic fields. Much work on the theory of electric fields, computations on transformation processes, etc., has been carried out at ENIN AN SSR (Power Engineering Institute, Academy of Sciences USSR). S. V. Vonsovskiy and others have led Soviet scientists in determining the present-day theory of ferromagnetism. V. Dellenbakh, A. M. Utevskiy (MTZ) and Ye. Gerek have done much research to determine the nature of electromagnetic processes when AC is converted to DC. Recently L. I. Gutenmakher, working at the Laboratory of Electric Modelling, Power Engineering Institute, Academy of Sciences USSR, developed the theory and method for representing various phenomena by modeling with the aid of circuits involving resistances and electronic tubes. Scientists at the Leningrad Polytechnical Institute are also doing research in this field. F. V. Maycrov is chiefly responsible for the advances made in the field of calculating and analyzing equipment.

General Power Engineering

The last 10 years have shown that there is a close relationship between the various power resources and the exploitation of power -- the so-called finished product. The better this relationship is exploited, the better the development of the field of power engineering. V. I. Veyts presents material showing that power engineering has had several definite trends: (1) Determination of fundamentals of power engineering theories to establish the relation between the various branches of the power engineering field, and between power engineering and the technology of industrial processes; (2) Development of new power engineering systems which will increase efficiency in the power engineering economy, and will improve the quality of the exploitation of power resources and power engineering equipment; and (3) Establishment of the theory of power engineering computations for selecting the optimum systems and disposition of elements in the power engineering field.

Power Stations, Networks, and Power Circuits

Information obtained from material presented by P. G. Grudinskiy, P. S. Zhdanov, A. I. Kolpakov and I. A. Syromyatnikov establishes that during the years preceding World War II this segment of the power field was expanding at the average annual rate of 23 percent over the preceding year. Data is organized under the following topic headings (1) power stations; (2) power transmission lines; (3) exploitation of power systems; (4) construction of the power systems and (5) theory of the operation of power systems. Topics 2 and 3 contain information on various power installations; brief mention is made of some of the potentialities of various power plants, e.g., the Sverdlovsk Power Station, the Dneprovsk Hydroelectric Power Plant, the Yaroslav Power Station, and others.

High-Tension Technology

Data compiled from material submitted by A. A. Gorev, A. M. Zalesskiy L. M. [illegible]skiy, and I. S. Stekol'nikov. Historical account of the development of the design and construction of high-voltage transmission lines from the first long-distance line (Bogorodsk-Moscow, 70 kilovolts) established in 1914 to present-day transmission lines of the Moscow power system (220 kilovolts). In recent years the All-Union Electrotechnical Institute, in cooperation with MTZ, has been conducting experiments on model lines to determine the best systems [illegible] for the proposed Kuybyshev-Moscow transmission line capable of carrying 500 kilovolts and having nonlinenar characteristics equivalent to 200-10³ [illegible]. Scientists at the Kharkov Electrotechnical Institute under the leadership of A. L. Vayner have been studying problems of grounded constructions. Mention is made of "Handbook on Methods for Preventing Overloading of Electric Machines Operating on 3 to 220 kilovolts AC," published in 1935 by the Ministry of Power Stations which, according to the editor, is one of the most valuable books ever published in the field of high-tension technology. Up-to-date reprints of the "Handbook" present a comprehensive picture of the development of Soviet high-tension technology.

Technology of Relay Safety Measures

Briefly traces history of power engineering on the basis of data presented by G. I. Atabek. Includes biographical data, noting briefly the scientific achievements of the various technicians mentioned. The first organization to study high-frequency protection measures was the Laboratory imeni Smurov, Leningrad (1932). Today the TEP, TsNIEL, and MosEnergo are famous for their work in high-speed filters for controlled high-frequency protection.

Telemechanics

Pioneers in this field started operations during the period 1932 to 1934. Since then, according to data furnished by M. A. Gavrilov, this particular field has risen on every occasion and is today a flourishing branch of the field of power engineering. Among the contributors in this branch were Ye. A. Kamenskiy, who, in 1945, developed a method for teleregulation with amplitude selection; S. A. Ginsburg, who is credited with the development of telemetering equipment operating on the frequency-pulse theory; and A. V. Fremke, who has done much work with the theory of telemetering instruments.

Industrial Electric Drives

B. L. Aronov, D. P. Morozov, V. K. Popov, and S. A. Rinkevich submitted the basic data for this section. Mention is made of the personnel working at laboratories of various large factories such as "Elektrosil," "Dinamo," KhEMZ (Khar'kov Electromechanical Factory), and others.

Electrification of Transportation

D. A. Smirnov submitted material for this section, which briefly describes progress made in the USSR toward electrification of various means of transportation. GOELRO has played a leading role in this endeavour. The more important issues, data, and personnel responsible for the development of electric-driven transportation equipment in the USSR are listed.

Electrification of Agriculture

I. A. Fedzko and N. A. Sazonov submit data on the progress achieved in the electrification of rural communities and agricultural enterprises. From 1917 to 1940 the over-all capacity of electrical equipment installed at agricultural enterprises rose from a mere 2,000 kilowatts to more than 275,000, while power consumption for the same period rose from 1.2 million annually to [illegible] million annually. In 1940, some 10,000 kolkhozes were receiving the benefits of electricity. Figures are given for proposed expansion by 1951.

The Biological Laboratory of VIESKh has been conducting experiments to determine the action of various elements of electricity on the growth of plants.

Electric Machine Construction

Information is extracted from material presented by A. Ye. Alekseyev, D. A. Ter-Gazarov, Ye. A. Kazovskiy, A. S. Kanter, Ye. G. Komar, M. P. Kostenko, R. A. Lyudkovskiy, G. F. Petrov and V. A. Tolvinskiy. Treats electric machine construction under the following topics: (1) turbogenerators; (2) hydrogenerators; (3) large d-c machines; (4) serial electric machine construction; (5) special duty machines; (6) some general problems in the field of electric machine construction; (7) some technological problems; (8) transformers; and (9) scientific research in the field of electric machinery. Topic 9 contains biographical information. It also suggests various trends which might be adopted in this field of technology.

Includes photographs of large machine installations and current equipment manufactured by Soviet industry.

High-Voltage Electric Machine Construction

Reference material is submitted by Yu. B. Batkevich. Describes briefly the functions of the "ElektroApparat" and "UralElektroApparat" Factories, which are the largest high-voltage machine construction enterprises in the USSR and owe their existence exclusively to Soviet rule. Although the text is taken up primarily with the function of the above-mentioned factories, the article also gives much information regarding the various scientific and technical personnel most responsible for the achievements of this branch.

Electrothermics

Material presented by A. D. Svenchanskiy and S. I. Tel'in shows that this field, which originated with the Revolution, has risen to gigantic proportions. In 1940 several factories were equipped with electric furnaces operating on 1 million kilowatts. Much of the development in the past few years can be attributed to the Conference of Technicians of Electrothermy and Electrical Furnaces, held in Moscow in 1940 under the aegis of the Academy of Sciences USSR.

Electric Welding

N. . Ilelyuk and I. Ya. Rabinovich present material showing the growth of this electric welding field. It is stated that electric welding can be called a purely Russian invention, as it was developed by V. V. Petrov in 1803. In 1940 over 5 million tons of metal products were welded in the USSR. During Soviet rule, electric welding has become an independent field. At present technicians are determining optimum methods for welding two substances of the same material as well as those of different materials.

Cable Technology

According to material presented by S. M. Braginyn, there were only four cable factories in the USSR in 1918. The first hydroelectric station in the Leningrad area was built in 1920; it was equipped with cables manufactured by the "Bolshevik" factory, one of the four original factories. Since then, the industry has grown. Present-day tasks facing the industry are greater economy of material as well as increasing the quality of production.

Electrical Measuring Technology

Material presented by Ye. G. Shramkov shows that this branch of the power engineering field started in 1909 with the organization of the Bureau of Weights and Measures. The editor briefly describes the history of the development of this field, mentioning names of scientists and scientific organizations most responsible for its achievements. Includes several photographs of modern measuring instruments.

Electronics

Material is presented by P. V. Timofeyev, who gives a history of the development of this branch, which is one of the newest scientific fields in the USSR. At present there is a trend for the production of all types of electronic devices utilized by industrial enterprises.

Radio Engineering

L. . Kivatskin submits material on the development of the radio engineering field in the USSR. Mentions 1926 studies conducted by the Scientific

Research Institute of Communications for the Red Army, which is located somewhere in the Far Eastern part of the USSR, to determine the effect of long-range transmissions on the upper harmonics. During the war, all radio factories moved eastward, but have since resumed operations in their former localities. In 1943 the Soviets put into operation the world's most powerful broadcasting station.

Illumination Engineering

In October 1921, M. A. Shatelen, while attending the Eighth All-Russian Conference of Councils, read an article on the significance of illumination engineering to the various branches of the people's economy. Since then, according to P. M. Tikhodeyev, this field has become very important in the development of USSR industrial might. The authors list the more famous scientists and organizations which helped make illumination engineering the important science that it is today.

Insulating Materials

K. A. Andrianov, N. P. Bogoroditskiy, and B. M. Tareyev present material on the study and manufacture of insulating materials. Much of the progress in this field is traced to a few mental giants, of whom A. F. Ioffe is the best known. Mentions the All-Union Bureau for Electric Insulation as the organization contributing most to this field.

Electrotechnical Metals and Alloys

Edited by A. S. Zaymovskiy, this section contains biographical sketches of various scientists in this field.

Higher Electrotechnical Schools

The material, submitted by L. D. Bel'king, is divided into two main parts (1) electrotechnical schools in the prerevolutionary period, and (2) Soviet higher electrotechnical schools. Very generally discusses the length of the courses and the number of students which can be accommodated.

Stalin Prizes for Outstanding Work in Electricity

Gives 1941 through 1946 Stalin Prize winners for various fields of endeavour in power engineering.

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